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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/629,284	07/29/2003	Arun Kwangil Iyengar	YOR920010663US1	5707

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EXAMINER
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DOAN, DUC T

ART UNIT	PAPER NUMBER
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2188

DATE MAILED: 09/01/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

**Application No.**

10/629,284

**Applicant(s)**

IYENGAR, ARUN KWANGIL

**Examiner**

Duc T. Doan

**Art Unit**

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 July 2005.  
2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.  
3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-28 is/are pending in the application.  
4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.  
5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.  
6) ☒ Claim(s) 1-28 is/are rejected.  
7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.  
8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.  
10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).  
11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☐ All b) ☐ Some \* c) ☐ None of:  
1. ☐ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)  
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)  
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 8/15/03.  
4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.  
5) ☐ Notice of Informal Patent Application (PTO-152)  
6) ☐ Other: \_\_\_\_\_.

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**DETAILED ACTION**

*Status of Claims*

Claims 1-28 are in the application.

Claims 1-28 are rejected.

*Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-3,9,11-12,14-16,19-28 rejected under 35 U.S.C. 103(a) as being unpatentable over Rabii et al (US Pub 2002/0032691) and in view of Mattis et al (US 6915307).

As for claim 1, Rubin describes a method of managing storage of objects of sizes smaller than a storage transfer unit in a computer system, comprising the steps of: maintaining a plurality of storage transfer units (segments) in a first storage medium organized by a quantity of free space in a storage transfer unit (Rabii's page 3, paragraphs 38,39; Fig 5); maintaining in a second storage medium a cache comprising a copy of at least one of said plurality of storage transfer units (Rabii's Fig 10: #520 data buffers); The claim further recites in response to a request to

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store an object of a size less than a storage transfer unit : searching for a cached storage transfer unit with sufficient free space to store the object ; if no such cached storage transfer unit can be found, identifying an uncached storage transfer unit with sufficient free space to store the object and storing a copy of the identified storage transfer unit in the cache; and storing the object in the identified storage transfer unit by modifying at least one data structure in the cache and subsequently writing a cached copy of the storage transfer unit to the first storage medium.

Although, Rabbi describes allocating new objects to a segment in a disk (Rabbi's paragraphs 83,84; Fig 5). Rabbi does not describe the claim's detail of other steps to handling an object's request. However, Mattis describes the situation of a client requesting for an information object and the object is not found in cache; the location of object is retrieved from a disk (Mattis's column 20, lines 21-30); the object is written into the allocated write aggregation buffer; the directory is updated; Subsequently, the buffer allocated write aggregation buffer is written back to an arena (Mattis's column 20, lines 40-65; Fig 10A); It would have been obvious to one of ordinary skill in the art at the time of invention to include the steps for storing an object as suggested by Mattis in Rabbi's system to assure the integrity of information objects (Mattis's column 21, lines 1-15).

As for claims 2-3, wherein the first storage medium comprises disk storage (claim 2; Rabbi's Fig 5); wherein the second storage medium comprises main memory (claim 3; Rabii's Fig 10).

As for claim 9, Rabii describes maintaining at least one list of storage transfer units (Rabii's Fig 5: #220-2 segment); maintaining at least one tail pointer to a plurality of contiguous unallocated storage transfer units (Rabii's Fig 5 a ring of allocated and unallocated segments);

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wherein the step of identifying an uncached storage transfer unit further comprises the steps of searching for an uncached storage transfer unit on the at least one list with sufficient space (Fig 4: data partition portion; page 3 paragraph 45 maintains free space of a segment) and if such an uncached storage transfer unit can not be located, identifying an unallocated storage transfer unit from the at least one tail pointer (Fig 4: data partition portion; page 3 paragraph 45 detects a segment is full; page 5 paragraph 84 selects the unallocated segment).

As for claim 11, Rabii describes the step of maintaining at least one tail pointer to a plurality of contiguous unallocated storage transfer units. The claim rejected based on the same rationale as in the rejection claim 8. Rabbi further describes assigning objects into unallocated segments in page 5 paragraph 84. Thus in order to write objects into unallocated segments, it requires a pointer to point to the location of remaining unallocated segments in the segment ring as shown in Rabbi's Fig 5.

As for claim 12, the claim recites wherein a cached copy of a storage transfer unit is written to the first storage medium in response to at least one of: (i) an object in the storage transfer unit being updated; (ii) a number of changed bytes in the storage transfer unit exceeding a threshold; (iii) a number of changed objects in the storage transfer unit exceeding a threshold; and (iv) the cached copy being about to be purged from the cache. Rabii describes the objects remain in cache until there is a shortage of in-memory-objects or data buffers. In this case the object is purged from cache (Rabii's page 7, paragraph 108).

As for claim 14 the claim recites wherein the cached copy is about to be purged from the cache as a result of at least one of a cache replacement policy and the computer system being about to go down. The claim rejected based on the same rationale as I the rejection of claim 12.

Rabii further describes a large write back during a system shutdown process (Page 5, paragraph 80).

As for claim 15, Rabii describes wherein a storage transfer unit comprises a sector (Rabii page 3, paragraph 45, segment).

As for claim 16, the claim recites a method of maintaining a plurality of objects in a storage transfer unit, comprising the steps of: identifying an object position in the storage transfer unit by an object offset in the storage transfer unit; in response to a request to one of access and update a storage transfer unit, copying the storage transfer unit so that different objects are copied into different buffers; performing at least one update to at least one object in the storage transfer unit by modifying at least one buffer; and after the at least one update has occurred, updating the storage transfer unit from the at least one buffer. The claim rejected based on the same rationale as in the rejection of claim 1. Rabii describes the staging of data into buffers in memory and to write buffers back to the disk (Rabii's column 16, line 55 to column 17 line 2). Rabii further describes the arenas contain at least one fragment (corresponding to the claim's object; Rabii's column 17, lines 19-30).

As for claim 19, Rabii describes wherein the storage transfer unit is maintained on disk and the at least one buffer is maintained in main memory (Rabii's Fig 9, Fig 10).

As for claims 20-22, Rabii describes wherein the step of updating the storage transfer unit from the at least one buffer further comprises copying a plurality of objects from buffers to the storage transfer unit in a contiguous area so that free space in the storage transfer unit is contiguous (claim 20; Rabii's Fig 5: #240 free space); wherein the storage transfer unit

comprises a sector (claim 21; Rabii's Fig 5: #220 segment); the step of maintaining a number of free bytes in the storage transfer unit (claim 22; Rabii's Fig 5: #240 free space).

As for claim 23 Rabii describes wherein the step of performing at least one update further comprises using the number of free bytes in the storage transfer unit to prevent overflow (Rabii's paragraph 45).

As for claim 24, Rabii describes wherein the copy of at least one of the plurality of storage transfer units included in the cache is one of a partial copy and an inexact copy (Rabii's page 6, paragraph 106).

Claims 25, 27 rejected based on the same rationale as in the rejection of claim 1.

Claims 26,28 rejected based on the same rationale as in the rejection of claim 16.

Claims 4-8,10 rejected under 35 U.S.C. 103(a) as being unpatentable over Rabii et al (US Pub 2002/0032691), Mattis et al (US 6915307) as applied to claims 1, and further in view of Chen et al (US 6804761).

As for claims 4-5, the claims recites wherein the step of searching for a cached storage transfer unit further comprises identifying a cached storage transfer unit with sufficient free space to store the object giving preference to such cached storage transfer units with less free space; (claim 4); wherein the step of searching for a cached storage transfer unit further comprises identifying a cached storage transfer unit with a least amount of free space sufficient to store the object (claim 5); The claim appears to describes steps of selecting a cached storage transfer unit to best fit the object. Rabii does not describe the claim's detail of searching for a cached transfer unit. However, Chen describes a chunk manager capable of searching for the

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next highest size standard memory blocks to fits an application request (Chen's column 5, lines 1-20). It would have been obvious to one of ordinary skill in the art at the time of invention to include the block allocation method as suggested by Chen in Rabbi's system to reduce the fragmentation of memory (Chen's column 1, lines 60-64).

As for claims 6-8, the claims recite wherein the step of identifying an uncached storage transfer unit further comprises identifying an uncached storage transfer unit with sufficient free space giving preference to storage transfer units which minimize fragmentation (claim 6); wherein the step of identifying an uncached storage transfer unit further comprises giving preference to storage transfer units with more free space (claim 7); wherein the step of identifying an uncached storage transfer unit further comprises identifying a storage transfer unit with a most free space (claim 8). The claims rejected based on the same rationale as in the rejection of claims 4-5. Chen further describes of searching through a range of blocks with different sizes in order to determine an acceptable block and thereby reducing the fragmentation of memory space (Chen's column 5 line 65 to column 6 line 20). Examiner notes that the teaching of allocating free blocks, scanning through free blocks taught by Chen is applicable to memory spaces in any storage medium.

As for claim 10, the claim recites the step of maintaining a plurality of lists of storage transfer units organized by a quantity of free space in a storage transfer unit. It is rejected based on the same rejection of claim 6-8. Chen further describes memory pools with lists of standard block size (Chen's column 5, pages 1-10; scanning memory pools having free blocks column 5, lines 43-55).



Claims 13,17 rejected under 35 U.S.C. 103(a) as being unpatentable over Rabii et al (US Pub 2002/0032691), Mattis et al (US 6915307) as applied to claims 1, and further in view of Carbrera et al (US 5802599).

As for claim 13, wherein an application program writes at least one storage transfer unit to disk in a transactional manner. Rabii does not describe the claim's aspect of writing in a transactional manner. However, Carbrera teaches that by providing writing objects in a way to reduce the fragmentation in the storage device, thus optimizing the access time to the device; The reducing in storage device access time would be advantageous for the system handling transactional requests such as database management system (Carbera's column 4, lines 5-25). It would have been obvious to one of ordinary skill in the art at the time of invention to include the storage device accessing method as suggested by Carbera in Rabbi's system to reduce the fragmentation of a storage device and thereby optimizing the access time to the storage device of the transactional based system such as database management system (Carbera's column 4, lines 5-25).

As for claim 17, the claim recites when an object which does not have a highest offset is deleted, adding the offset to a list; satisfying an allocation request by using an offset from the list; and if an offset is not reused by the time the storage transfer unit is updated from the at least one buffer, storing a placeholder on the storage transfer unit indicating the object has been deleted. The claim rejected based on the same rationale as in the rejection of claim 1. Rabii further describes directory structures (Rabbi's Fig 8: #300 references field) to kept track of objects existing in memory. Rabii and Mattis do not describe the claim's aspect of reusing the memory buffer. However Carbrera describes the preferred steps of reusing the memory buffer

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(Carbrera's column 3, lines 40-47). It would have been obvious to one of ordinary skill in the art at the time of invention to include the objects grouping method as suggested by Carbrera in Rabbi's system to reduce the fragmentation of the storage device (Carbrera's column 3, lines 5-12).

Claim 18 rejected under 35 U.S.C. 103(a) as being unpatentable over Rabii et al (US Pub 2002/0032691), Mattis et al (US 6915307) as applied to claims 16, and further in view of Carbrera et al (US 5802599), Garthwaite (US Pub 2004/0172507).

As for claim 18, the claim recites in response to an object update which would cause a storage transfer unit to overflow, moving the object to a new storage transfer unit and storing a forwarding pointer in the previous storage transfer unit. The claim rejected based on the same rationale as in the rejection of claim 17. Rabii and Mattis do not describe the claim's aspect of overflowing. However, Carbrera further describes if the object does not fit in a used buffer containing one or more objects, that object is stored in a refreshed buffer (Carbrera's column 3, lines 40-47). It would have been obvious to one of ordinary skill in the art at the time of invention to include the objects grouping method as suggested by Carbrera in Rabbi's system to reduce the fragmentation of the storage device (Carbrera's column 3, lines 5-12). Rabii, Mattis and Carbrera do not describe the claim's detail of storing a forwarding pointer. However, Garthwaite describes a method of placing a forwarding pointer once an object has been moved (Garthwaite's page 7, paragraph 63). It would have been obvious to one of ordinary skill in the art at the time of invention to include the forwarding pointer method as suggested by Garthwaite in Rabbi's system to allow processing the references contained in the object being evacuated while continuing of evacuating process (Carbrera's Figs 10, 11A; page 7, paragraphs 63-65).

*Conclusion*

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

When responding to the office action, Applicant is advised to provide the examiner with the line numbers and page numbers in the application and/or references cited to assist examiner to locate the appropriate paragraphs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Duc T. Doan whose telephone number is 571-272-4171. The examiner can normally be reached on M-F 8:00 AM 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mano Padmanabhan can be reached on 571-272-4210. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

**Kevin L. Ellis**  
**Primary Examiner**

*Kevin L. Ellis*